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In order to bridge the gap between educational research and practice, a study was concluded to identify specific reading skills which posed particularly difficult problems for Mexican American first grade children, but apparently caused little difficulty for their Anglo counterparts. Seventeen words emerged as being particularly difficult for the Mexican American child to comprehend. The study concentrated on procedures for teaching ten of these concept words, such as over, under, etc. The tutorial method in which older students were utilized to teach the first grade students on a one-to-one basis was found to be most effective. A model to be applied in obtaining desired learning outcomes in other Mexican American classrooms was then formulated. Objectives were first stated behaviorally then procedures were formulated to obtain the objectives. These procedures were tried and empirical evidence was gathered on their effectiveness, whereupon the procedures were revised and the new model reapplied. (DA)

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Final Report

A Pilot Study to Apply Evaluation-Revision Procedures in First-Grade Mexican-American Classrooms

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May 17, 1968

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I. BACKGROUND TO THE STUDY

A. INTRODUCTION

In the history of American education, efforts to solve educational problems have either taken a traditional research approach or attempted immediate implementation of promising "practical" schemes. Unfortunately, neither of these approaches has been very successful. Research projects often lead to reports and journal articles, but rarely to changes in the conduct of education; "practical" efforts typically have little research evidence to support them, are idiosyncratic, not easily reproducible, and usually result in minimal long-term benefit.

What is needed is something to bridge the gap between educational research and practice; this bridge must be built by trained researchers and knowledgeable practitioners working together toward a common goal. Two conditions must be met in such an effort: a tangible product must be developed, such as instructional materials or an instructional system; and the product must be subjected to successive evaluations and revisions until it is known to accomplish its objectives. Examples of product development through the application of an evaluation-revision strategy are found almost exclusively in programmed learning materials. Rarely, however, has this strategy been applied to the typical classroom setting as a whole.

The present pilot study was conducted to determine the degree to which the evaluation-revision strategy could be applied to regular classroom instruction in which interactions among students, materials, and the teacher were considered.

There were two major outcomes expected from the study: first, an illustrative example of effective classroom instruction; and second, a model for obtaining such effective instruction. The second outcome was of greatest concern, for an isolated example of effective instruction would be of minimal benefit if the means by which it was obtained were not clearly identified and reproducible. This second outcome, a model of the developmental procedures, was intended to enable educators to answer this question: "Given specific educational objectives, how can an instructional system be developed that will enable almost all students to achieve the objectives?"

B. POPULATION, GRADE LEVEL, AND SUBJECT MATTER

1. Student Population

Mexican-Americans were selected as the target population for two reasons. First, they are a minority group of significant size in the United States and present a particularly distressing picture in terms of education. Proportionately, more Mexican-Americans drop out of school than do members of any other identifiable group. Educators concerned with Mexican-Americans have reported their difficulties in providing instructional experiences leading to satisfactory progress through school. Second, it was felt that developing effective instruction for this population sets especially stringent requirements; if instruction can be made effective for this population, it should be effective for other populations as well. That is, the model for obtaining effective instruction should have more general applicability if it were developed with Mexican-American students than if it were developed with middle-class Anglo-American students.

2. Grade Level

The first grade was selected since it seemed most useful to develop effective instruction--and procedures for obtaining such instruction--as early as possible in the school program. This recognizes a need to shift research and development efforts to the early grade levels, in order to develop programs that prevent future learning problems.

3. Subject Matter

Typically, one of the greatest deficiencies the Mexican-American student brings to school is in the area of language skills. This deficiency is a particular problem when one considers that reading instruction takes up the greatest percentage of school time in the first grade. Further, it has been suggested that the high incidence of dropouts among Mexican-American students in junior high school is due, primarily, to the frustrations and failures occasioned by the Mexican-American's significantly reduced reading ability. For these reasons, reading instruction was selected as the subject matter for the study.

C. CONDUCT OF THE STUDY

1. Evaluation-Revision Strategy

The "evaluation-revision strategy" used in the study was developed originally for producing effective self-instructional materials; in the present study, the strategy was adapted and extended to the total classroom situation.

The evaluation-revision strategy is composed of these elements:

a. Educational objectives are specified behaviorally, and means of assessing the objectives are determined.

b. Tentative procedures for achieving the objectives are formulated. These may be modifications of existing procedures, or procedures specially prepared for the objectives.

c. The tentative procedures are tried out and empirically evaluated. Evaluation may be formal, through administration of assessment instruments, or informal, through observation and judgment.

d. The procedures are revised as a result of this evaluation. Revisions are made to overcome deficiencies identified by the evaluation.

e. The process of trial-and-revision continues, on a cyclical basis, until procedures are known to accomplish the specified objectives. In the sequence of trial-and-revision cycles, the early trials are limited in scope (i.e., cover a small amount of instruction) and the scope gradually expands as successful revisions are made. While there is no rigid criterion for evaluation procedures, they usually involve informal evaluation during early trials and increasingly formal evaluation as the scope expands.

2. Team Approach

One source of the existing gap between research and practice lies in the lack of meaningful contact between researchers and practitioners. Frequently, the researcher imposes his ideas on the practitioner and thereby enlists only superficial cooperation in implementing the idea. On the other hand, the practitioner may put his ideas into practice with little more than casual consultative assistance from the researcher.

An alternative approach, the one used in the present study, is to have the researcher and the practitioner work together as a team, with a common goal. In this study, teachers and administrators were considered part of the research and development team along with the experimenters. Numerous techniques were employed to gain the active participation of the school personnel. For example, teachers were recompensed for the out-of-class time they spent in discussing the study, suggesting revisions, and assisting with the development of materials. (Henceforth in this document the full-time research and development staff will be referred to as "the experimenters.")

3. Phases

The study was conducted in three phases:

a. Location of the problem area. During the first phase, a reading skill that was a problem for the Mexican-American first-grade student, but not for his Anglo peer, was identified.

b. Development of instructional procedures. In the second phase, instructional procedures to overcome the reading skill problem were developed empirically, using the evaluation-revision strategy.

c. Development of an instructional system. During the final phase, instructional procedures and the support activities necessary to implement them were integrated to form an instructional system. The total instructional system was developed through the application of the evaluation-revision strategy.

Each of the three major phases is described in greater detail below.

II. PHASE 1 - LOCATION OF THE PROBLEM AREA

This phase of the project was concerned with the identification of an area in reading that was a problem for the Mexican-American student but not

for his Anglo peer. This task was carried out through discussions with school personnel, informal trials with students, observations of reading instruction, and testing.

A. DISCUSSIONS WITH SCHOOL PERSONNEL

During a number of meetings with classroom teachers, remedial reading teachers, and school administrators, many reading-related problems were suggested. While school personnel were unanimous in indicating that Mexican-Americans in the first grade did not learn to read as well as first-grade Anglo students, they were much less consistent in specifying possible problems that contributed to reading deficiencies. Only at a general level were school personnel in agreement: the Mexican-American child was deficient in language skills. When asked to amplify on this "language skills deficiency," school personnel tended to cite the following:

1. A paucity of vocabulary background, leading to inferior communication (comprehension and speaking).

2. Poor listening skills. Generally, Mexican-American students were characterized as unable to listen attentively to instruction and to comprehend accurately what was being said.

3. Poor speaking ability. It was held that Mexican-American children spoke in single words and fragmented, incomplete utterances.

4. Reticence to speak. Teachers indicated they had difficulty in getting these children to verbalize.

5. Pronunciation problems. Students tended to omit initial and final consonants (seemed to have difficulty hearing these).

6. Seatwork. Students were not able to work independently, and good worksheets and materials were not available.

7. Lack of understanding of critical words used in reading instruction. Referred to as "direction words," these were words giving location or position in time or space (such as "on," "under," "above," "first," "last," etc.).

B. INFORMAL TRIALS WITH STUDENTS

Prior to the fall semester 1966, students were brought to the laboratory at SDC for informal experimental trials to gain information relevant to the suggested problems. Fourteen 5- and 6-year-old Mexican-American children, who attend a neighboring parochial school, and eight 5- and 6-year-old Anglo children of SDC employees participated in these trials. Four types of experiences were employed: (1) listening to and reading individual words; (2) listening to and reading brief stories to identify characters and sequence of events; (3) simple problem-solving tasks requiring the student to verbalize solutions to the problems; and (4) Mexican-American children were engaged in conversations with the experimenters.

Results of these informal trials were: (1) the Mexican-American children did not read as well as the Anglo children of the same age; (2) there were no appreciable differences in listening abilities between the two groups of children; and (3) the Mexican-American children verbalized responses about as well as the Anglo children.

C. OBSERVATIONS OF READING INSTRUCTION

After school opened in the fall of 1966, further information on reading-related problems of Mexican-American students was gathered through observations

of reading instruction in classrooms. Four first-grade classrooms in the two participating schools were observed almost daily for six weeks; in addition, four other first-grade classrooms, two second-grade classrooms, an English-as-a-second-language classroom, and a preschool classroom were observed a few times.

During these observations, the experimenters kept anecdotal records of such things as: (1) what forms of instruction were used; (2) how students were evaluated and grouped; (3) how students and teachers interacted; (4) how students interacted with each other; and (5) the type and frequency of learning problems. The experimenters also met frequently with teachers to discuss why certain activities were used and to obtain teachers' reactions to students, methods of instruction, materials, etc.

Not surprisingly, teachers in the four first-grade classrooms observed most extensively showed marked differences in their instructional methods and teaching styles. In general, the teachers operated as follows:

1. Two teachers used the reading series adopted by the State of California, and followed the instructional method preferred in Los Angeles. In this method, the class is organized into three groups; at any given time, one group works directly with the teacher in a "reading circle," one group works at tables in reading-related "follow-up activities," and one group engages in either a reading-related task or one of a wide range of "other activities" (e.g., painting, listening to records). The three groups are intended to be relatively homogeneous in ability (however, in fact, a considerable range of individual differences exists within each group).

2. One teacher used the state-adopted reading series, but stressed a language-experience approach. The class was divided into two groups, with the groups alternating in meeting with the teacher. While meeting with the teacher, students dictated stories that the teacher wrote on large sheets of paper; while at their seats, students illustrated their stories and worked on other follow-up activities.

3. One teacher used the Miami Linguistic Readers and associated learning activities. A critical activity with this approach is the use of pattern drills designed to improve students' control of English structure. The teacher used the three-group organization; follow-up seatwork was either related to the reading series or related to general reading skills.

The classroom observations tended to support the earlier conjectures that Mexican-American children are deficient in listening skills and in knowledge of basic concept words. When the teacher posed problems to the students (by asking questions in the reading circle, or by giving instructions for a seatwork activity), students often were unable to respond appropriately. An unresolved question was whether students were unable to respond correctly because they did not understand oral instruction (that is, they were deficient in general listening comprehension skills), or because correct responding was dependent upon students' understanding of certain vocabulary terms (i.e., concept words that form the vocabulary of instruction). The observational evidence seemed to indicate that lack of knowledge of basic concept words was the more important factor causing student difficulties.

Following the extensive observations in the two Mexican-American schools, two nearby Anglo schools were visited; brief observations of reading instruction were made in five first-grade and four second-grade classrooms. The investigators looked for evidence of the same learning problems that had been seen in Mexican-American classrooms. While these brief observations did not yield definitive results, they generally supported the conclusion that Anglo children do not manifest learning problems because of poor listening skills or because of lack of knowledge of basic concept words.

D. A TESTING PROGRAM

In order to gain further and more specific information relevant to the suggested and observed learning problems, a testing program was conducted. Both Mexican-American and Anglo children were tested, at three grade levels: B1 (first semester of the first grade); A1 (second semester of the first grade); and B2 (first semester of the second grade). Four tests were used to examine these four questions:

1. Do Mexican-American children read more poorly than their Anglo peers? To answer this question, students who had had a year's worth of formal reading instruction (i.e., B2 students) were tested with the Sentence Reading and Paragraph Reading subtests of the Gates Primary Reading Test. When the two subtests are combined, the maximum possible score is 71. Mexican-American students (N=26) achieved a mean score of 13.0; Anglo students (N=25) achieved a mean score of 52.4. While the number of students tested is very small, the results support the notion that Mexican-American students are, in fact, less effective readers than Anglo students.

2. Are differences between Mexican-American and Anglo students in reading ability due to differences in general ability? To provide information on this question, the Oral Vocabulary and Number subtests of the Inter-American Test of General Ability were used. This test has been developed for use with Mexican-American students and is available with either English or Spanish directions. When administered to students in the two Anglo schools, directions were given twice in English. For Mexican-American students, the directions were given first in English and then in Spanish. Directions were tape-recorded by a bilingual adult, who made both the double-English and the English-Spanish recordings. Too few B1 students were tested to warrant examining their data; results for the A1 and B2 grades were as follows (maximum possible score = 32):

	A1		B2	
	Mexican-American	Anglo	Mexican-American	Anglo
No. of Students	25	25	24	30
Mean Score	19.8	21.0	21.3	23.5

Since there were no reliable differences between Mexican-American and Anglo students, the conclusion was that measured differences in reading ability were not a function of differences in general ability.

3. Do Mexican-American students have more poorly developed listening comprehension skills than Anglo students? To answer this question, a listening comprehension test had to be developed; a valid test of this skill could not be located. With the permission of the publisher, the Paragraph Reading subtest of the Gates Primary Reading Test was used; pictorial material was reproduced in special answer booklets, and the textual material was tape recorded. The student heard the text read to him on the tape recording, and responded in the

special answer booklet. This test seemed particularly useful for listening comprehension purposes, since the questions proceed from simple declarative sentences to complex paragraphs composed of four lengthy sentences. The following results were obtained (maximum possible score = 26):

	B1		A1		B2	
	Mexican-American	Anglo	Mexican-American	Anglo	Mexican-American	Anglo
No. of Students	29	24	22	23	20	29
Mean Score	21.9	24.2	23.5	24.6	23.7	25.0

Since the differences between the two groups were not significant, it was concluded that the two groups did not differ in listening comprehension skills.

4. Are there any differences between Mexican-American and Anglo students in their knowledge of concept words that form part of the vocabulary of reading instruction? Through classroom observations, discussions with teachers, and examination of relevant literature, 40 concept words were identified. A special test was developed to measure these words ("Direction Words Test"). The critical feature of the test involved holding all other vocabulary terms constant when assessing a given concept word.

The test was administered to students at all three grade levels. When the results were examined, it was clear that the Mexican-American and Anglo children were similar for 23 of the words; some words caused few errors for both groups (e.g., largest, in, down) and some words caused many errors for both groups (e.g., fewest, identical). For the other 17 words, the evidence indicated that the Mexican-American student is less likely to know the concepts than the Anglo student.

Following the testing program, the results were discussed with the participating teachers. There was general agreement on the importance of the 17 words which had emerged from the Directions Words Test. In subsequent meetings, it was decided to focus on ten of the words as the subject-matter for the study. The rest of the study was devoted to the development of instructional procedures to teach the concepts conveyed by these ten words: top, bottom, alike, different, first, middle, last, under, over, and underline.

The following are some representative examples of these words as they are used in reading instruction. The examples are drawn from Teachers' Manuals for the Ginn Series, from Los Angeles City Schools follow-up materials, and from classroom observations.

"Direct the children to look at the picture at the top of the page..."

"Then direct them to find the picture at the bottom...."

"Color the pictures that are alike."

"Mark the word in each box that is different."

"Have the children name the color of the first crayon."

"Who is in the middle of the picture?"

"Have the pupils tell which picture comes first, then next, then last..."

"Put the word card over the word that is the same."

"Draw a line under the words that are like the underlined words."

"Underline the two words that are alike."

III. PHASE 2 - DEVELOPMENT OF INSTRUCTIONAL PROCEDURES

To gain some preliminary ideas on how the ten concept words might be taught, nine of the teachers in the two Mexican-American schools were asked

to teach them, with the experimenters observing instruction. After two weeks, all teachers were interviewed concerning their methods, successes, failures, and feelings about how the instruction might be improved.

The nine teachers used a variety of instructional approaches, but there were some common characteristics. In almost all cases, teachers used available resources: existing charts, objects in the classroom, the chalk-board; only two teachers prepared materials especially for the concept words. The most frequently used "method" was that of lecture-demonstration, followed by questions asked of the students. Most teachers dealt with related words at the same time, e.g., alike vs. different, top vs. bottom.

The instruction was not particularly effective. Most students showed little learning, and the few who did were almost balanced by students who exhibited increased confusion among the concept words. However, these teacher-conducted attempts were useful in providing the experimenters with a starting point. Procedures that appeared most promising were used as initial forms of instruction for the application of the evaluation-revision strategy; they are described in the following sections.

A. LARGE-GROUP INSTRUCTION

Large-group instruction was defined as occurring when the teacher worked with the entire class or with ten or more students at a time.

The first type of instruction studied was the use of the existing three reading groups. The teacher first described some concept words to the whole class, then conducted instruction with one group in the reading circle while the other two groups worked at their seats with supplementary (follow-up)

materials. Subsequently, the reading groups rotated so that each had a turn in the reading circle while the others worked at their seats.

The subject matter was the terms "over" and "under." Using an 8" x 11" drawing in which boys and animals were depicted going over or under various objects, the teacher explained the terms to the students in the reading circle, and asked them questions about the drawing. Next, using objects in the classroom, the teacher called on individual students to perform physical activities ("Put the book over the chair." "Put the airplane under the table.").

The students participated in follow-up exercises at their seats using two worksheets. Tape-recorded directions asked the students to "Put an 'X' on the flag that is over the line" and to "Put an 'X' under the tree." There were six examples of each class of exercises. Examination of students' follow-up worksheets showed that few had mastered the two concept words.

During successive days, instruction was revised a number of times. Larger and clearer charts were tried; increased and varied manipulative and performance tasks were used; refinements in the follow-up activities were made, particularly in the provision of feedback for each response.

As experience with large-group instruction continued, it became clear to the investigators and teachers that little learning took place unless the teacher repeated the instruction many times. A single presentation to a class would enable only a few students to achieve mastery, even when the instruction was revised a number of times and was carefully planned and sequenced. Nonetheless, this instructional procedure did serve a useful purpose, that of orienting the students to the concepts they were to learn subsequently.

In its final form, this procedure was called Teacher-Led Orientation. Its purpose was to introduce the students to the concept as preparation for other instructional activities. It contained these features:

1. The teacher informed the class of the concepts to be learned, and defined them.

2. The teacher illustrated the meanings of the concepts through the use of common classroom objects and specially prepared large charts.

3. Using pretest results as a guide, the teacher called upon knowledgeable students to answer questions on the concepts ("Is this the top of the window?" "Are these blocks alike or different?").

4. Finally, the teacher called upon a few students, who had missed the concepts on the pretest, to respond to questions. These were students who were most likely to have learned the concepts from this instructional procedure.

B. STUDENT PAIRS

The use of "student pairs" within the same classroom (i.e., first graders assisting other first graders in mastering learning tasks) was the next form of instruction tried out.

Student pairs were formed by the teacher, based on pretest results and her judgment of their potential congeniality. "Alike" and "different" made up the subject matter.

As a first step, pairs of students were given very general directions ("Help each other learn the meanings of 'alike' and 'different'") and were provided a variety of materials. Among the materials used were seatwork sheets, individual pictures of identical and different objects, and sets of large blocks.

This technique was explored with about ten pairs. Numerous revisions were made, based on observations of the pairs in action. In general, revisions tended to add more structure to the situation: pairs were shown examples of useful activities; the more knowledgeable student was given brief training in relevant tasks; instructional directions were tape recorded.

At this time the investigators tried out a workbook series (The ABC Learning Activities, by John D. McNeil, American Book Company, 1966) in which many of the ten concept words were treated. The series was administered to students from a new classroom. The first trials were conducted by the investigators, with 14 children who needed instruction on "top" and "bottom." The appropriate workbook was administered to two groups of seven students, in two 20-minute sessions on consecutive days. On a posttest, only four students demonstrated mastery.

Next, the workbooks were administered in small-group settings, in which each knowledgeable first-grade student helped four of his classmates. The appropriate dialogue was tape recorded. This procedure did not work well; the young "helpers" were overburdened assisting four other students.

Finally, the workbooks were administered to student pairs. In this case, a first-grade helper worked with only one of his classmates. From trials with this approach, an effective instructional procedure evolved that was called Small-Group Paired Helpers. The procedure was found to be beneficial for students who were average or better in general learning ability (as judged by their teachers) and who possessed adequate listening skills in English (again, as judged by their teachers). The major features of this procedure were:

1. The teacher examined the pretest results and determined which students were to receive this form of instruction, and who their peer helpers were to be.

2. Learners were seated in a group, with their helpers standing behind them.

3. Instruction consisted of a special workbook (based on The ABC Learning Activities series) and a tape recording.

4. Helpers had two tasks: to make certain the learner was attending to the correct visual material in the workbook while taped messages were played; to provide the learner with feedback on the correctness of his responses. Helpers were trained in these tasks by their teachers prior to instruction.

C. OLDER STUDENTS AS TUTORS

While instructional activities to this point had proven effective with some learners, they had not worked with the slower learners. It seemed clear that first-grade helpers did not possess sufficient skills to assist their slower classmates, and that the teacher did not have sufficient time to work with such students on an individual basis. Consequently, the next procedure explored was the use of older students in the elementary school as tutors for slow first-grade students.

In the first trials, The ABC Learning Activities workbooks were used. Some sixth-grade students were selected and were given the workbooks to study. Then they attempted to tutor a first-grade learner by presenting orally the written dialogue in the workbooks and assisting the learner wherever he had difficulty responding appropriately. Results of these trials made it clear that older tutors showed great promise, but that the learners needed more

varied practice than was provided in the workbooks. The investigators set out to develop instructional materials for upper-grade tutors to use with slow first graders.

Through repeated evaluations and revisions, a new instructional sequence was developed. Four major features characterized this sequence: (1) a gradual progression of activities that start with responses the learner can make easily (e.g., yes or no oral responses) and advance to responses called for on the posttest; (2) establishing appropriate responses to one concept before going on to a related concept (e.g., establishing "over" before treating "under"); (3) recycling through visual materials, the same pictures being accompanied by different oral stimuli that require different responses (thus, although a workbook may contain only 50 pages, more than 150 responses can be called for); and (4) tape recording of the verbal instructions, so that tutors can concentrate on their interactions with learners and do not have to be concerned with presenting oral stimuli.

An instructional sequence of this sort was prepared for "top" and "bottom." The investigators acted as tutors in the initial period of its development; then fifth-grade students were trained to use the workbook and tape recording. Results with the new sequence were very good, and another sequence was developed in a similar fashion for "first," "middle," and "last."

Three forms of tutoring by older students were developed during this period: Structured Individual Tutoring, in which the tutor followed the taped-recorded sequence and used the special booklet; Unstructured Individual Tutoring, in which the tutor was given booklets, charts, and classroom objects as vehicles for

instruction and chose his own methods of working with the younger child; Small-Group Tutoring, in which the tutor worked with two or three learners in a group, in either a structured or an unstructured manner.

D. THE TEACHER AS A TUTOR

As the development of the different instructional procedures progressed, a few students continued to make errors although they had worked with an upper-grade tutor. The next step was to have the teacher work with these students in small groups. This was tried out and found to be useful. When the teacher acted as a tutor of a small group of students (three to four students seemed to be a good size), she chose the time, place, and type of instruction to use.

This instructional procedure, Teacher as Tutor, was used with learners who had not adequately mastered concepts when administered by other instructional procedures. The teacher identified students with common learning needs and worked with from one to four of them using available materials such as booklets, charts, and classroom objects.

E. TUTORING IN THE HOME

For a few students, none of the different instructional procedures were found to work. While these students differed from each other in many respects, they appeared to have one common characteristic: inattentiveness. These students were usually described by their teachers as "immature, restless, with low attention spans." Whether or not the descriptions were accurate, it was clear that there were students who defied the best efforts to teach them.

To attempt to provide family encouragement and additional practice for these students, the experimenters explored the use of tutoring in the home.

Experiences to that time indicated that a home tutor would require (1) carefully specified objectives, (2) related, well-constructed materials, and (3) training in the tutoring tasks.

Further, there was a need (because of language problems) for a bilingual person to act as a liaison between the school and the home. Such a person was located through a local Community Action Agency, a woman who was completely bilingual, active in community affairs, and who had particular interest in the education of children in the neighborhood. She was employed as a "Home Visit Consultant," and was given responsibility for the tutoring in the home. After receiving training by the experimenters or school personnel, the Home Visit Consultant acted as follows: first, the school gave her the name and address of the student and a description of his particular instructional problem; next, she visited the home to determine whether or not someone (a parent, another adult relative, a teen-aged brother or sister) was interested in, and capable of, tutoring the first grader; if a home tutor was located, the consultant went over the student's problems with the tutor, and demonstrated the use of the workbooks that had been developed for upper-grade tutors; while tutoring went on, the consultant assisted the tutor whenever the latter requested help; finally, the consultant notified the school as soon as the home tutor reported that the student had achieved the objectives and the student was then tested in class. This instructional procedure, Parents as Tutors, was tried out and revised on a limited basis and was found to be effective for those few students who received instruction at home.

IV. PHASE 3 - DEVELOPMENT OF THE TOTAL INSTRUCTIONAL SYSTEM

After the various types of instructional procedures had been developed individually, they were integrated to form an "instructional system." The total system was composed of the different instructional procedures and all the support activities necessary for implementing them. The instructional system was tried out and revised in three distinct ways: (1) with the investigators retaining major control over the trials; (2) with school personnel in the two target schools conducting the trials; and (3) with school personnel in two new schools conducting the trials.

A. EXPERIMENTER-CONDUCTED TRIALS

For the first trials with the total instructional system, two classrooms were used, one in each of the target schools. Neither of the two teachers involved had assisted in the development of the instructional procedures.

At each school, a meeting was conducted that included one of the investigators, the teacher, the principal, and the vice-principal. The instructional system was discussed, and arrangements were made for support activities. Many implementation decisions (who trains the tutors, grade level of tutor, time of day for tutoring) were decided on by the staff in each school. The result was that the trials in the two schools had different characteristics; they are described below separately.

School A. The class was a mixed B1-A1, with 20 B1 students and 10 A1 students. Upper-grade tutors came from a fifth-grade class and were trained by the vice-principal. Tutoring by upper-grade students was done during the regular school day.

The system trial took five weeks to conduct, with 16 days* devoted to instruction. Results were as follows:

	(Pretest) Do Not Know	(Posttest) Do Not Know
Top/Bottom	4	0
Alike/Different	14	1
First/Middle/Last	11	0
Over/Under	11	1
Underline	4	1

Total number of students making errors on pretest = 22, on posttest = 2.

School B. The class was a mixed kindergarten-B1, with six kindergarten students and 24 B1 students. Upper-grade tutors came from a fifth-grade class, and were trained by their own teacher. Tutoring by upper-grade students was done during the half-hour before the regular school day began.

The system trial took five and one-half weeks, with 22 days devoted to instruction. Results were as follows:

	(Pretest) Do Not Know	(Posttest) Do Not Know
Top/Bottom	6	1
Alike/Different	11	2
First/Middle/Last	11	2
Over/Under	11	1
Underline	15	0

Total number of students making errors on pretest = 22, on posttest = 3.

*The original plan was for daily instruction; however, other needs and contingencies caused teachers in each school to modify the planned schedule somewhat.

The following observations were made after these trials: (1) A total of 54 students were in the two classes. Ten students made perfect scores on the pretest; the other 44 received instruction on from one to five units. (2) After instruction, five students still demonstrated lack of mastery of some concepts. Thus, 39 students (88 percent) were brought to the point of complete mastery. (3) While all of the instructional procedures were in need of minor revisions, the most important revisions were those related to implementation. In effect, the major problem to be solved was the maintenance of effectiveness after the experimenters withdrew their active participation in the instructional system.

B. TRIALS BY TARGET SCHOOL PERSONNEL

The experimenter-conducted trials were completed near the end of the school year. The summer vacation period was devoted to revising instructional procedures and to preparing the total instructional system for trials by school personnel without the active participation of the experimenters. The critical feature of the latter task was the preparation of a document called "System Description and User's Guide," in which all instructional procedures and support activities were described.

When classes began in the fall, the instructional system was tried out in two classrooms, one in each of the target schools. A copy of the "User's Guide" was given to each teacher and a copy was given to the school administrators. At each school, one of the experimenters met with the principal, the vice-principal, and the teacher; the "User's Guide" and all instructional materials and procedures were reviewed, and responsibilities for different aspects of

the instructional system were determined. During the subsequent trials, the experimenters met with school personnel weekly to find out what had been done during that week, why, what problems had been encountered, and suggestions for improving the instructional system. Characteristics of the trials at the two schools are described separately below.

1. School A

The class was composed of 32 B1 students. The teacher previously had taught second-grade classes, and had no familiarity with the instructional system.

During the planning meeting, school personnel decided to use sixth-grade students as tutors. The vice-principal agreed to serve as the tutor trainer, and trained five tutors in two training sessions.

The teacher arranged for six fourth-graders to assist her in scoring the pretest and recording results. The teacher felt that the test scorers did well and that they seemed to enjoy the task. However, she did not use the fourth-graders to score and record mastery test results, and cited these reasons: it was inconvenient to obtain the fourth-graders; by scoring the tests herself, she learned more about individual students; by having the sixth-grade tutors score their learner's tests, the tutors were made aware of the learner's continued difficulties.

Tutoring by older students was carried out during the regular school day. The first-grade and sixth-grade teachers did not establish definite plans for the tutoring, and the sixth-grade teacher provided tutors whenever it was convenient for her schedule and program. The first-grade teacher used the

tutors whenever they were available. During the first few weeks of the trial, the sixth-grade tutors were provided daily; later they were sent to the first-grade classroom infrequently.

All of the instructional procedures were used except Parents as Tutors and Unstructured Tutoring. The teacher indicated on three occasions that she was "about ready to have the parents help two of the students," but the steps for implementing this procedure were never followed.

Beyond the initial planning meeting and the training of the sixth-grade tutors, the interactions between the administrators and the teachers concerning the instructional system were informal and infrequent.

The total time taken for the trial was seven weeks. The teacher's weekly comments made it evident that instruction went on daily for the first few weeks, then became increasingly irregular. The results were:

	(Pretest) Do Not Know	(Posttest) Do Not Know
Top/Bottom	19	4
Alike/Different	22	5
First/Middle/Last	26	7
Over/Under	25	5
Underline	32	8

Total number of students making errors on pretest = 32, on posttest = 9.

2. School B

The class was composed of 16 kindergarten students and 14 B1 students; due to scheduling problems, only the B1 students were involved in the trial of the instructional system. The teacher was the same one who had assisted in the experimenter-conducted trial the previous semester.

During the planning meeting, the principal indicated that sixth-grade students were to be used as tutors, and that the first-grade teacher was to train them. Instead, the first-grade teacher located two tutors who had been involved in the experimenter-conducted trial, and used them as tutors and test scorers.

Tutoring by the sixth-graders was done during the half-hour before school began. While the tutors were faithful in coming to school early, the teacher reported that the learners were less regular.

The only forms of instruction used were Teacher-Led Orientation, Small-Group Tutoring, and Teacher as Tutor. When conducting the orientation, the teacher regularly went through all ten concept words rather than only the unit under consideration at that time.

The trial lasted five and one-half weeks, with these results:

	(Pretest) Do Not Know	(Posttest) Do Not Know
Top/Bottom	6	0
Alike/Different	7	3
First/Middle/Last	8	4
Over/Under	7	0
Underline	9	1

Total number of students making errors on pretest = 14, on posttest = 5.

The following observations were made after these trials: (1) A total of 46 students were in the two classes. None of them made perfect scores on the pretest. (2) After instruction, 14 students still demonstrated lack of mastery of some concepts, while 32 students (69 percent) were brought to the point of complete mastery. (3) Without the experimenter's active participation in the

instructional system, the previously achieved level of effectiveness was not maintained. Clearly, 69 percent mastery was far below the intended 90 percent. (4) The most critical factors affecting results were those of understanding and communication: the "User's Guide" proved insufficient to help school personnel completely understand the system; school personnel did not communicate with each other during the trials, thus preventing the effective implementation of the instructional system.

C. TRIALS BY SCHOOL PERSONNEL IN NEW SCHOOL SETTING

The next step was to validate the instructional system in a school district that had not been involved in the developmental process in any way.

To overcome the problems encountered in the earlier trials, the "User's Guide" was revised substantially, and new implementation procedures were established. Final trials were conducted in two schools other than those involved in the study to that point; school personnel in the new schools were completely unfamiliar with the system. The new schools were located in another section of Los Angeles in which the majority of the population is made up of Mexican-Americans. While the two schools shared many common features, they differed in one significant aspect: School C was a traditionally operated institution; School D was unconventional, in that the staff was involved in numerous innovations. A particularly important feature of School D was that intragrade and intergrade tutoring among students had been used informally for several years.

The following implementation procedures were used in the two new schools:

1. Extensive meetings were held with the principals and vice-principals, in which the instructional system was discussed in great detail. The importance of adequate communication among school personnel was emphasized. Also stressed was the necessity for someone in the school to assume the role of system manager, whose primary duty was to assist with interactions among personnel.

2. Orientation meetings were held with the first-grade teachers, and all instructional procedures were studied carefully. Procedural steps to be followed in implementing the system were presented, and all questions raised by the teachers were answered to their satisfaction.

Characteristics of the trials in the two schools are described separately below.

1. <u>School C</u>

Two B1 classrooms were involved, one with 29 students and one with 30. The principal chose to use sixth-graders as tutors, and trained 50 of them himself. Such a large number were trained because the principal believed that the experience was very beneficial for the sixth-graders. Also, he felt it would be worthwhile to have trained tutors available if tutoring was expanded to cover additional curriculum. The vice-principal was designated to be system manager.

Teacher 1 scored all tests herself. Teacher 2 had fourth-graders score the pretest. She had her first-graders score their own mastery tests. Both teachers used all instructional procedures except Parents as Tutors and Unstructured Tutoring.

Results for the two classes were:

	(Pretest) Do Not Know	(Posttest) Do Not Know
Top/Bottom	18	1
Alike/Different	22	2
First/Middle/Last	18	4
Over/Under	26	2
Underline	41	3

Total number of students making errors on pretest = 54, on posttest = 8.

2. School D

Two B1 classes participated, one with 26 students and one with 23. The principal chose to have fourth-, fifth-, and sixth-graders serve as tutors. A remedial reading teacher was appointed system manager and also served as tutor trainer (18 tutors were trained). In addition, some of the trained tutors nominated and trained other students to be tutors when a need arose.

The school was on double session, and the two teachers shared the same room. They interacted regularly with each other, and conducted instruction along the same paths. Results were:

	(Pretest) Do Not Know	(Posttest) Do Not Know
Top/Bottom	20	4
Alike/Different	27	5
First/Middle/Last	21	3
Over/Under	27	4
Underline	36	4

Total number of students making errors on pretest = 47, on posttest = 5.

After the trials at the two schools, the following observations were made: (1) A total of 108 students were in the four classes. Seven students made perfect scores on the pretest, and 101 received instruction. (2) After instruction, 13 students still demonstrated lack of mastery of some concepts. Thus, 88 students (87 percent) were brought to the point of complete mastery. (3) For School C, 46 of 54 students reached complete mastery (85 percent). For School D, 42 of 47 students (89 percent) achieved mastery.

D. OBSERVATIONS ON THE INSTRUCTIONAL SYSTEM

The final instructional system that was developed in this study is described in detail in TM-3930/001/00, "Description and User's Guide for a Small-Scale Instructional System." The following are some observations on the use of the system gathered during the system trials.

1. Teacher-Led Orientation (Large-Group Instruction)

a. At the present level of development, the procedure did not result in many students mastering concept words. This is not to say that large-group instruction is always ineffective; however, much more development would have to be carried out in crder to improve the procedure substantially.

b. The principal use of the procedure was to introduce students to the concepts with which they would be concerned in subsequent instruction. There was some evidence that students who received this introduction/orientation were better able to master the concepts when they were given other forms of instruction, supporting a frequently expressed notion that providing students with a set prior to instruction facilitates learning.

c. While the "User's Guide" spelled out in detail the activities that made up this procedure, teachers who employed it made many modifications to the activities. For example:

- A few teachers used the procedure regularly, whenever a unit was begun, ignoring the recommendation for use only when a third or more of the class needed instruction.
- One teacher went through all ten words every time she used the procedure. That is, instead of carrying out the full procedure for just the words in a unit, she concentrated on the large charts and worked with the class on all ten words.
- One teacher ignored the step of calling on knowledgeable students to answer questions before calling on the students who needed instruction. She called only on the students who needed instruction, including bringing them to the front of the classroom to answer questions; this seemed to affect the students adversely, for they were required to display their ignorance before their peers.

2. Small-Group Paired Helpers

a. The procedure was effective with students who were judged by their teacher to be average or better in general learning ability, and who were judged by their teacher to have adequate facility with English. When the procedure was administered to slower-learning students, it was found to contain too little practice to be effective. And, when the procedure was used with students who were predominantly Spanish-speaking, the students were unable to learn because the instruction on the tape recordings was presented in English.

b. Students who were to be helpers had to be trained prior to administration of instruction, or they would not perform their tasks correctly. The basic task for helpers was that of informing learners of the correctness of their responses; if tutors were not trained, they tended to tell the learner what response to make (e.g., the helper would respond before the learner, rather than after the learner, and would "give away" the correct answer).

c. Teachers who tried out the instructional system made numerous adaptations such as:

- One teacher never supervised the learner-helper pairs, but spent her time with students who were engaged in other activities. This resulted in some degradation of effectiveness, since learners who experienced difficulties were unable to receive assistance from the teacher.
- One teacher implemented the procedure at a listening center, with learners and helpers wearing earphones. This arrangement was effective, but had the limitation of only providing instruction for five learners at a time, since the listening center had ten earphones. Therefore, the teacher was obliged to administer the procedure repeatedly whenever more than five learners were to receive it.
- The student pretest results of one class indicated that almost all students would be involved as helpers at least once during the system trial. The teacher trained the entire class in the helper's tasks

prior to beginning the trial, and briefly reviewed the training before each administration of the procedure. This technique appeared to work well.

- One teacher failed to train helpers at all. Each time the procedure was administered, she told the helpers what to do. This proved to be very ineffective; helpers were unsure of their roles, and made numerous errors.
- One teacher tried using the procedure without helpers, having the learners listen and respond on their own. She did not feel that many students learned from this arrangement, but did find it useful as a review technique for previously learned concepts which the student had forgotten.

3. Structured Individual Tutoring

a. The procedure was effective with students who were less than average in general learning ability and had adequate facility with English, as judged by their teachers. Since the tape-recorded stimuli were in English, the procedure was not beneficial for learners who did not understand common English nouns.

b. The instructional materials, while preplanned, contained sufficient flexibility for them to be adapted to individual differences among learners. If a learner needed instruction on one concept, but not on its antonym (e.g., "over" but not "under"), the materials could be used to concentrate on the instruction needed. If a learner demonstrated the need for additional practice, sequences could be repeated. Similarly, if a learner demonstrated mastery of a sequence, he could be skipped past redundant instruction and taken to the next sequence.

c. In order for tutors to achieve success with first-grade learners, they had to be trained before attempting to serve as tutors. A special tutor-training package was developed for this procedure, using the evaluation-revision strategy. The tutor-training package was to be used by an adult in the school (the "tutor-trainer"), who was responsible for making certain that an adequate supply of trained tutors was available.

d. Local adaptations were made to the procedure during the system trials:

- Different adults acted as tutor trainers at the various schools--a vice-principal, a remedial reading teacher, an upper-grade teacher, a first-grade teacher. Classroom teachers, either first grade or upper grade, found it very difficult to provide the time needed for careful training.
- Tutoring took place at different times--before school, during the school day, or after school. Generally, tutoring during the regular school day was easiest to administer.
- A number of different locations were used for tutoring--in the first-graders' classroom, in an unused classroom, in storerooms, in a teachers' lounge, in an auditorium, and in a hallway outside the first-graders' classroom. No one location appeared superior to others.

4. Unstructured Individual Tutoring

a. The procedure was particularly useful with learners who possessed minimal facility with English. However, this required bilingual tutors who could conduct much of the instruction in Spanish and could slowly blend in the English concepts to be mastered.

b. Tutors who were to operate with this procedure had to be identified as potentially effective by the tutor trainer. Not all tutors were able to conduct unstructured tutoring; however, the tutor trainer usually was able to determine this during the tutor-training sessions. In addition, tutors who had had some experience with structured tutoring appeared to be the most successful with unstructured tutoring.

c. While a very few tutors were capable of working out good instructional interactions on their own, most tutors needed to be given some instructional materials with which to work. The "User's Guide" recommended that tutors be given the structured tutoring booklets, the paired helper booklets, and some classroom objects to use as vehicles for unstructured tutoring.

5. Small-Group Tutoring

a. The procedure was effective with some learners who had particular characteristics, viz., learners who were especially shy and unconfident. Such learners frequently appeared anxious when they had to make every response during individual tutoring. These seemed more comfortable in a small group where they could observe and emulate more outgoing peers.

b. A second use for the procedure was as a substitute for individual tutoring when not enough trained tutors were available at a given time. Rather than postponing instruction until more tutors were trained, it was found that Small-Group Tutoring was a convenient method for dealing with the shortage.

c. Not all tutors were capable of administering Small-Group Tutoring. For some older students, the special requirements in this procedure were too demanding. In particular, some tutors had the tendency to focus on only one

learner in the group, usually the learner who responded the most accurately; he tended to ignore the particular needs of students who were less accurate. Determination of which tutors to employ in Small-Group Tutoring was made by the tutor trainer, on the basis of their performance during training sessions.

6. Teacher as Tutor

a. Teachers used this procedure as a follow-up to other procedures that had not resulted in students' reaching mastery.

b. Teachers also found this procedure useful when only a few students needed instruction on a unit. Thus, when only three or four students were identified as needing instruction on "alike" and "different," a teacher would choose to use this procedure with them, since it involved minimal logistical arrangements.

c. Teachers implemented the procedure at different times during a school day. Most teachers tutored students simultaneously with other instructional procedures; one teacher tutored students during the class "free activity period"; one teacher had students come to school early for this tutoring.

7. Parents as Tutors

a. The procedure was limited to use in homes where an older relative was interested in, and capable of, administering the instruction. There was not always an interested older relative in the home, and in many homes, there was no older relative who was capable, particularly with respect to competence in English.

b. Since contacts had to be made with the home, first to verify that an older tutor was available and second to train the tutor, a special bilingual

community lay person was found to perform this task. This "Home Visit Consultant" served a unique role for facilitating communication between the school and the home.

8. Testing

Testing of students was an integral part of the instructional system, to diagnose learning needs and to measure the achievement of objectives. The final version of the system included a pretest and ten mastery tests. When a student completed an instructional procedure for a given concept, he received a mastery test. Since each test measured students on all ten concept words, the results could be used not only to determine his achievement of the particular words he had just received practice in, but also his retention of previous learning or his ability to understand words he had missed on the pretest and had not received instruction in.

One problem in administering the tests was the students' tendency to look at each other's test booklets. This was not due to any desire to "cheat" but rather was caused by a lack of confidence on the part of many students (including many higher achievers). Even when a student knew the correct answer, he would tend to look at someone else's booklet before making a response. This lack of confidence manifested itself again if the teacher or experimenter was standing nearby. A student would frequently point to a response and look at the adult for approval before marking the answer booklet.

At first, classroom objects--charts, books, etc.--were placed between students, with little success. Next, large cardboard sheets folded to form three-sided carrels were tried; while effective, these sheets were extremely

awkward to use. Finally, individual cardboard dividers were created; they were made of a small wooden block in which a 14" x 18" piece of cardboard was inserted. They proved to be very effective and easy to use. The students themselves very quickly learned to set up and take apart the dividers whenever a test was administered. (School personnel reported that they had a great many occasions to use the dividers during trials of the instructional system and during other instructional activities, e.g., individual or small group tutoring in one corner of the classroom.)

Since so many tests were administered, the scoring and recording of results placed a burden on the teacher. One way this load was reduced was by using students to score the tests and record results. Teachers were able to train third-and fourth-graders to perform these tasks. They also found that having upper-grade tutors score their own learner's mastery tests provided valuable feedback to the tutor.

V. A MODEL FOR APPLYING EMPIRICAL EVALUATION-REVISION PROCEDURES IN IMPROVING CLASSROOM INSTRUCTION

The two principal products of this study were (1) an illustrative example of effective classroom instruction, and (2) a model for obtaining such instruction. The former is described in detail in TM-3930/001/00; the latter is described below.

A. OVERVIEW

The main characteristics of the model used in developing the instructional system are (1) an empirical approach, involving successive evaluations and revisions of procedures until they are known to accomplish specified objectives, (2) the conduct of the research and development activities in the school setting

using normal, intact classes, and (3) the active participation of regular classroom teachers and school administrators in the research and development effort.

In this strategy, objectives are specified behaviorally; tentative procedures for achieving objectives are formulated; the tentative procedures are tried out and empirical evidence gathered on their effectiveness; the procedures are revised as a result of this evaluation; the process of trial and revision continues until objectives have been achieved.

As applied to classroom instruction, the approach involves the total configuration in which interactions among students, teachers, materials, and procedures are considered in an integrated manner. This makes the process more complicated than it would be if applied to the development of materials alone. Basic to the approach is the organization of instruction into short segments designed to achieve a limited number of objectives. A segment is an arbitrary unit of instruction covering a specified number of objectives. The length of time to complete a segment varies, depending on the number and kind of objectives involved and on the criterion of performance set for individuals and for the class as a whole.

Short segments are required for maximum efficiency, since the evaluation-revision strategy is costly in time and effort. What is learned initially in developing a short segment of effective instruction can then be applied to the design of subsequent segments. Materials, equipment, and procedures are obtained and/or developed for only one segment at a time; that segment is tried out on students before the instructional system is developed further. In this way,

large expenditures can be avoided, and there is a greater probability that the end product will produce satisfactory results. This is in distinct contrast to the traditional method of preparing a whole semester or year's course at a time before trying it out.

Revisions of a given segment are largely based on objective measures of student performance. Evidence gathered in trying out an individual segment is used to revise the segment itself and to redesign the plans for the next segment. Within a segment, individual instructional elements (e.g., large-group or small-group instruction, individual instruction, teacher-led instruction, student tutoring, programmed materials, other materials) may be singled out for trial and revision independently of other procedures. When all such elements or components are found to work, they are integrated with each other and tried out as a unit. When all units are found to work, they are then combined and tried out as a total system, first within the target school in classrooms not involved in the development of the system, and finally in a new school district where none of the personnel has had any prior contact with the system. Initial tryout of the system as a whole in the target school is with the participation of the experimenters. Final tryouts within the target school and in the new school district are conducted by school personnel alone.

The developmental process is divided into four phases: (1) designing the total system; (2) evaluating and revising each segment of the system; (3) evaluating and revising the total system; and (4) validating the total system in a new school setting. The evaluation-revision strategy is basic to each of the four phases, which will be described below in more detail.

B. DESIGNING THE TOTAL SYSTEM

In the first phase--the design phase--a plan is prepared describing the initial version of the instructional system, including all elements and operations. The system design specifies the objectives in behavioral terms, all functions to be performed in achieving the objectives, interrelationships among functions and personnel, and for each function the following: purpose, methods, materials, frequency, time, personnel requirements and interactions, training, equipment, location and space requirements, and evaluation procedures.

Sound planning during this phase saves time, effort, and expense during the developmental phases (in which materials, equipment, and procedures are developed through iterative trials and revisions). The better the planning in the design phase, the fewer trials and revisions will be needed to develop effective instruction. All relevant research, an analysis of the conditions under which the system must operate (capability, resources, and constraints), experience, and intuition, are brought to bear in planning for the initial version of the system. It is in this phase that a need for the system must be clearly established; the worst possible outcome is to spend much time, money, and effort to develop something that was not necessary in the first place. As was done in the present study, the specific instructional needs to be treated in the system must be determined, including the empirical demonstration of the needs. It is not sufficient to "guess" or "believe" that a need exists; there must be unambiguous evidence of the need.

C. EVALUATING AND REVISING EACH SEGMENT OF THE SYSTEM

When dealing with the total, complex classroom configuration, the developer has a wide range of things he may change to improve instruction and little

research or baseline data to guide him. A basic strategy employed in the present study to aid in decision making was the "big step"--that is, focusing on those things that would appear to give the biggest possible payoff for the least amount of effort. A complex procedure was avoided where a simpler one might work. Generally those changes were initiated that caused the least disruption to school operations and staff and that required the least amount of work and cost to implement. Wherever possible, resources closest at hand and most readily available were used. Therefore, before developing new materials, existing materials were examined for their adequacy; before going to individualized instruction, improvement of large-group and then small-group instruction was tried.

In initiating tutoring procedures, the experimenters started with first-graders helping each other, then upper-graders with first-graders, then teachers, and finally parents (at home). Informal procedures were tried first and used wherever they were found to work. Structured, or "programmed," procedures were developed and used to fill instructional needs not satisfied by an informal approach.

When all individual procedures are developed within a segment, they are integrated into a total unit and tried out and revised as a whole. What is learned from developing one segment of effective instruction is applied to the design of the next segment in order to reduce the number of trials and revisions necessary for the achievement of objectives.

D. EVALUATING AND REVISING THE TOTAL SYSTEM

During this phase, all instructional segments are integrated into a total system and tried out as a whole, within the target school, first with

the participation of the experimenters and finally by the school personnel alone.

Certain specifications, which were developed for conducting each segment, are analyzed in light of the system operating as a whole. An integrated plan, including rule-following and decision-making criteria, training of personnel, test administration, data recording, display and usage, and materials and equipment handling must be worked out. A User's Guide is prepared that describes all elements in the system and how to use them. The system is then tried out. Revisions may be made during the tryout. When the tryout is completed, the results are analyzed. At this point, revisions may be made that apply across all segments or within a particular segment. Individual segments may undergo further trial and revision independent of other segments, and the system is then tried out again as a whole.

To this point, the experimenters were involved in conducting many support activities, e.g., testing, training personnel, etc. Next, instruction is conducted by the school staff alone. The revised User's Guide is turned over to the school personnel, who implement all aspects of the system without outside assistance. The experimenters may observe classroom instruction and interview the school personnel weekly, without making any suggestions for modifying instruction.

There is no plan to make revisions to the system while it is tried out. However, the school staff may do so if they feel it necessary. In this case, they report changes and reasons for them in the weekly interview. After the tryout is completed, the school personnel and the experimenters analyze the results and decide on revisions to the system.

E. VALIDATING THE TOTAL SYSTEM

The next question to be answered is, "How well does instruction succeed in a school district where none of the personnel has been involved in the development of the system?" Here, the researchers conduct orientation briefings and initial training of key personnel, turn over the revised User's Guide and all materials to the school, and withdraw completely until the trial is completed. In other words, the school, after initial orientation to the system, conducts the instruction completely on its own. After the trial, school personnel and the experimenters analyze results and discuss changes to the implementation plan, to the User's Guide, and to any aspect of the instructional system. Changes are made and the system is considered completed (as far as the formal development is concerned). New school districts using the system will, of course, make changes to fit the needs of the local situation.

The steps in this strategy of evaluation and revision are numerous and complex. For additional clarity, they are presented--as a set of ordered, procedural instructions, with an accompanying flow chart--in the Appendix to this report.

VI. DISCUSSION AND CONCLUSIONS

A. THE EVALUATION-REVISION STRATEGY AND CLASSROOM INSTRUCTION

On the basis of student achievement, it seems appropriate to conclude that the evaluation-revision strategy was effective as a means of improving classroom instruction. That is, when the strategy was applied to achieve specified educational objectives, an instructional system was developed that did, in fact, result in the majority of students achieving those objectives.

However, as expected, the application of the strategy to a total classroom situation was more difficult and complicated than its use for materials development alone.

It is very unlikely that the strategy could be employed at the local school level without augmenting existing personnel. The time required for implementing this strategy probably is far beyond that available to teachers and/or administrators of a school. If an individual school wished to improve its instructional offerings by applying the strategy, arrangements would have to be made for released time for personnel, or for additional staff members who would be assigned to this function full time.

Similarly, the physical resources of a local school are likely to be insufficient. For example, few schools have adequate facilities for preparing and duplicating instructional materials such as tape recordings, booklets, tests, data-recording forms, and guides.

Further, the skills and attitudes required to state objectives behaviorally, develop tests, prepare materials and procedures, analyze data, and use data as a basis for modifying instruction are generally lacking within present school staffs.

Also generally lacking is an experimental attitude towards instruction. Evaluation is mostly subjective and irregular and is used to exhort students to do better rather than to analyze and modify inadequacies in learning conditions, including teacher practices. Participation in a project such as this can help school staff become acquainted with experimental procedures and begin to see their value. Several teachers involved in the present study were

surprised and pleased about (1) how much they learned about their students through continuous evaluation of instruction, and (2) the ways in which hard data could be used to indicate deficiencies in materials, procedures, teacher behavior, and other factors.

The evaluation-revision procedures developed during this pilot study obviously do not represent a definitive model. They represent an initial set of procedures that were effective in developing a small-scale instructional system within a limited amount of time.

The evaluation-revision strategy must be refined and developed further through the same empirical, iterative process used in developing effective instruction. Improvement in these procedures should eventually lead to a reduction in the number of trials and revisions necessary, in each phase of the developmental process, to obtain effective instruction. This also implies a long-range developmental process so that the model described in Section V can be continuously iterated and refined.

B. TEAM APPROACH

To develop successful instructional materials or systems, the gap between research and practice must be bridged. A team approach is required in which teachers, administrators, and experimenters work closely together in developing effective instruction. Each has certain skills, knowledge, understandings, and ways of looking at the instructional situation that the others do not have. To achieve optimum results and efficiency, there must be a blending of these resources and capabilities. Working relationships, operational procedures, and a general atmosphere must be established that further this blending.

Experimenters should not remain "outside experts" controlling all aspects of a project, while periodically requesting assistance from school personnel. Even though this is not the intention of the experimenters, their behavior frequently maintains such a situation.

In this study, the experimenters spent much time in the schools observing instruction, working with students, and planning with teachers and administrators. Nevertheless, the short duration of the project made it difficult for school personnel to feel this was their project and to involve themselves more significantly in the decision-making process. The pressures of time and other factors forced the experimenters to retain too much responsibility, for too many aspects of the project, for too long. This created problems when the experimenters began to withdraw and turn over functions to the school.

To achieve a team approach and experimental attitude, the following appear necessary. Experimenters must become a part of the school staff and literally "live" in the school. Ideally, they would have offices at the school or in the community close by. The establishment of working relations and of procedures requires time. There is a need for more long-range projects so that the experimenters and school personnel form an "interlocking instructorate," systematically shaping each other's behavior over a considerable period of time. Research and development must be a continuous and integral part of the school program and not a piecemeal, intermittent activity.

C. CLIMATE FOR CHANGE

If we are to meet the complex problems and challenges posed by a rapidly changing world, educational institutions that are open to change, flexible,

and adaptive are greatly needed; yet the history of innovation in education has been one of resistance to change. Where modification of traditional classroom practices requires significant changes in the roles and functions of school personnel, the resistance to change is likely to be great.

In this study two problems hindered the implementation of the instructional system: (1) school personnel tended to view the system as an adjunct to their "regular" operations, and sometimes failed to carry out system tasks; (2) the completed system was novel--calling for students, teachers, and administrators to perform new functions--so that natural resistance to change was evident.

The schools, by and large, operate as hierarchal structures in which students, teachers, and administrators relate to each other as subordinates and superiors. This structure, and the climate of defensiveness it fosters, inhibits experimentation, change, and creativity and causes problems in communication.

Communication problems and resistance to change took several different forms. A teacher would sometimes fail to request needed support. For example, a first-grade teacher might request tutors from a sixth-grade teacher. If the tutors did not show up, the teacher would use another instructional procedure or skip instruction for that day. A sixth-grade teacher would send the names of students to be trained to the tutor trainer. If the tutor trainer did not set up a training program, the teacher sometimes did nothing. In the above cases, when teachers were asked why they didn't follow-up on the matter, the response was sometimes "I didn't want to make a pest of myself," or, "I didn't feel it was my responsibility."

The experimenters received a great deal of cooperation from school personnel, but there were times that the latter did not appear to agree wholeheartedly with certain procedures (and frequently rightly so). This was hinted at, but usually not stated directly. The experimenters, too, did not always express their feelings about certain interactions and procedures for fear of jeopardizing their relationship with the school people wnose goodwill and cooperation were needed. In other words, there was much observing of protocol. The kind of frankness that would have contributed to maximum creativity and openness to change did not seem possible, given the time pressures of the project and the traditional modes of interpersonal interactions in the school setting.

As the project proceeded, the experimenters came to feel more and more that some explicit mechanism was needed to break down the hierarchical relationships and to facilitate openness, directness, risk-taking, and mutual trust in order to create a climate for change and experimentation. Experimentation is needed with encounter groups in which individuals meet in small groups, in a relatively unstructured situation, providing a climate for maximum freedom for personal expression, exploration of feelings, and interpersonal communication. Students, teachers, administrators, parents and experimenters working in the schools should participate in those group workshops.

D. INSTRUCTION OF MEXICAN-AMERICAN CHILDREN

While the present study was not intended to provide answers to specific questions raised concerning the education of Mexican-American children, there were some observations related to the instruction of these children that deserve mention.

Language Abilities

Lack of fluency in English is often stated as a major problem in the education of Mexican-American children. One notion is that most Mexican-American children are Spanish speakers; since instruction is in English, the children fall further and further behind in academic subjects while they are mastering English; a suggested solution is to use Spanish as the vehicle for instruction, until the children's English is good enough to handle academic work.

However, one of the most striking observations in this study was the broad range of language abilities found in first-grade classrooms. A few students were completely fluent in Spanish and knew almost no English. Some students communicated exclusively in English and knew very little Spanish. The rest of the students ranged between these two extremes, with varying degrees of fluency in both languages. Many students spoke a nonstandard form of English or Spanish. Also of interest was the observation that a frequent mode of communication was a type of pidgin, made up of English and Spanish mixed rather loosely (e.g., a student said, "Push la luz" for "Turn on the light," and another said, "Those are balunes," meaning "Those are balloons").

This language diversity presents a complex educational problem for which there is no panacea. It implies further that any attempt at bilingual instruction must take into account the local characteristics of the English and Spanish spoken. The student must be provided with continuous opportunities to hear standard speech and to become aware of differences between it and his own

language. However, this must be done by making the student aware of alternative ways of saying things and not by rejecting the student's speech (e.g., one teacher [in a bilingual program in a district not participating in the study] told a student who said "yo sabo" never to use that word again because it was ugly).

Use of Spanish

Early in the study, the question was raised, "Do the students know the meanings of the concept words in Spanish?" To provide an answer, a version of the pretest was prepared in Spanish, and one class was tested with both the English and the Spanish versions. Results showed that all four possible contingencies occurred: there were students who understood words in English but not Spanish; students who understood words in Spanish but not English; students who understood words in both languages; and students who understood words in neither language. Given the few students demonstrating knowledge in Spanish but not English, and the limited amount of time available, special materials or instructional sequences to facilitate the translation from Spanish to English were not developed. This is not to say that many students would not have profited from an instructional sequence that developed mastery in Spanish first and then went on to develop mastery in English; there simply was not enough time to explore extensively the possibilities of such bilingual instruction. However, upper-grade tutors, assisting learners in unstructured tutoring arrangements, were encouraged to use Spanish whenever they felt it would be helpful. A few tutors did so on a limited basis with some success.

Manipulative Activities

A frequently expressed notion was that young culturally disadvantaged children learn best when engaged in physical activities and manipulative tasks. Such activities and tasks were tried out early in the study and subsequently used only by a few teachers on a very limited basis. The purpose of the study was to bring the concept words into use in the reading-instruction context, which is fundamentally a paper-and-pencil situation. There was no interest in the student's ability to perform manipulative tasks unless this helped him in a reading or reading-related task, but manipulative tasks did not prove to be helpful in this way; extensive instruction was necessary before students learned the correct physical behaviors, and there was little indication of transfer from the physical behavior to the responses called for on the mastery tests.

Attitudes of Children

Mexican-American children have been described as having a cooperative rather than a competitive orientation. During this study, children were observed to engage willingly in cooperative tutorial arrangements. Students doing individual seatwork showed strong inclinations to work with other students. They also tended not to view testing as a special situation and would share responses freely. It appears that improvements in educational offerings for Mexican-Americans should capitalize on this cooperative orientation rather than stress competition.

This noncompetitive attitude and the lack of any special value placed on evaluation have been cited as reasons that Mexican-American children are slow

to acquire test-taking skills and perform poorly on tests. The need for instruction in test-taking techniques is mentioned frequently. Such instruction was given in the present study; the first portion of the pretest contained items on the mechanics of taking the pretest and mastery tests, including a gradual development of the skills necessary to respond appropriately. Students easily acquired the necessary test-taking skills.

Many writers have indicated that Mexican-American children tend to have poor self images, and have pointed to repeated failure in the classroom as a contributing factor. Student-to-student tutoring may mitigate this problem, given the sense of importance and pleasure tutors seem to derive out of the experience and the positive attitudes and success experienced by the learners.

Attitudes of School Personnel

Some school personnel tend to view Mexican-American children in stereotypical fashion. For example, commonly expressed remarks are: "They are all the same." "They have a short attention span and can't concentrate." "They're slow learners and one shouldn't expect too much from them." "It's difficult to get them to speak in class." "They shouldn't be allowed to use Spanish at school because that hinders their learning." Observations made in this study challenge these stereotypes, and indicate that such attitudes may, in fact, hinder the achievement of effective instruction.

Teacher behavior was sometimes inconsistent with attitudes expressed. For example, at the very outset of the study, teachers indicated that one problem in trying to teach Mexican-American children to read was the difficulty in getting them to speak, and thus develop oral language. Yet, in some classes, the teacher tended to inhibit speech, except when she called on one student at

a time to respond to a question in the reading group. Students engaged in seatwork were frequently reprimanded when observed talking to a neighbor, even though in many cases they were discussing their work and in relatively low voices. The teachers differed considerably in their threshold for tolerating "noise."

On the other hand, some school personnel made special efforts to learn Spanish and to speak with parents and children in that language. They sought out and encouraged communication--in either Spanish or English.

E. TUTORING

One of the most important results of the study was the finding that upper elementary students could tutor first graders and that first graders could tutor each other with considerable success. With training, elementary school pupils were able to assist other pupils in achieving specific, behaviorally defined objectives, and a positive relationship developed between the learner and tutor. The learner not only profited from the instruction but enjoyed receiving help from schoolmates. Tutors took their roles seriously, had a sense of importance, and seemed to derive pleasure out of the success of the learner. In several cases, teachers reported that an older tutor who was doing poorly in his own class, and who was considered a discipline problem, improved in his work and his attitude toward learning as a result of the tutoring responsibility. Despite the fact that some of the tutoring took place before the normal school day, students volunteered to do more tutoring.

Some first-grade students who had been passive nonparticipants in classroom activities made dramatic behavioral changes in the tutoring situation. As an

example, consider one child who had recently arrived from Mexico; she spoke almost no English and was never heard to utter a sound nor seen to smile during several weeks of observation of her class. She received instruction, along with two other first-grade learners, from a sixth grader. The latter, functioning in a very relaxed manner, began by using Spanish as the medium of instruction. The girl first responded in Spanish in a soft, barely audible voice. She then began interacting with the other two first graders in Spanish and soon began to speak more loudly, to smile, and to laugh. Finally, the tutor was able to teach her some of the English words and elicit responses from her in English.

Parents of tutors told school administrators of their pleasure at the student's participation in this project. Parents and relatives also received training as tutors and worked with their own children with positive results. The various tutoring arrangements also brought about an absolute increase in the amount of "teaching resources" available in the school. More children than before could be given some measure of individual attention; more practice could be given in learning tasks with which some children were having trouble. This increase in teaching resources was--in the very best sense--"cost-effective," for it required no expenditure of school finances.

Some teachers, who at first were skeptical about having students tutor one another, changed their minds after observing the effectiveness of tutors and the positive attitudes of learners and tutors. Some teachers who had been using tutors informally, prior to the project, welcomed additional support in the form of instructional and tutor-training materials and procedures.

When the experimenters were not involved in trials of the total system, the teachers failed to use two of the procedures--Unstructured Tutoring and Parents as Tutors. The effort required to contact parents, evaluate their potential as tutors, and train them was apparently perceived as excessive. There was no clear explanation as to why the teachers did not use Unstructured Tutoring. They may not have read the "User's Guide" carefully, or may have felt they were supposed to use the tape recordings provided (the tapes were part of structured tutoring). Another deviation from prescribed procedures was that some teachers used all instructional procedures (except the two mentioned above), and in sequential order, rather than using instructional procedures selectively with different children according to established criteria.

Another conclusion was that tutoring should not be limited to the "brighter" students or "higher achievers." It was found that average and below-average upper graders, with training, could successfully teach younger pupils, and that it was beneficial to their morale and subsequent performance in their own classes. With first graders, pairings were made on the basis of mastery of a particular objective, so that each student had opportunities to be a helper regardless of his overall standing in the class.

Upper-grade students, working with structured materials, can branch students to more advanced material or to remedial sequences; but this requires much more training than when using a fixed, linear approach.

In addition to the three basic modes of intergrade tutoring (unstructured, structured linear, and structured branching), an upper-grade student can work

successfully with two or three learners at one time. The small-group situation appears to be better for some students who feel under pressure when they have to make all responses. In the small group, there is less pressure and they can observe, mimic, and learn from their peers.

Some students can tutor effectively with very little training. Most, however, require training. It is anticipated that with experience in tutoring, students going into new curriculum areas will need less training and more of them will be able to function effectively with the less-structured modes of tutoring. After receiving training and having tutoring experience, some tutors were quite capable of training other pupils to be tutors.

Many of the procedures and materials developed for upper-grade tutors could be used effectively at home by a parent or relative. The use of a bilingual community resource person as a consultant to contact parents, to assess their willingness and potential ability to tutor their children, and to train the parents was quite valuable. The parents who tutored their children were positive about the experience, and the children responded favorably to the parental attention, according to the home consultant and the classroom teacher.

One principal conclusion was that the tutorial process (with elementary school children teaching each other) has great potential for planned development as an educational force, provided that children receive appropriate training for their roles as tutors and helpers. Through this process, students can develop positive attitudes towards, and become more interested in, learning, school, and each other. Given more responsibility in the learning process, the students will feel more responsible for their own learning and can, over time,

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become more capable of self-directed learning. However, the impact of the tutoring concept is likely to remain limited as long as it is a piecemeal program, an appendage to the regular curriculum and teaching procedures, a procedure used mainly for remedial work. For greatest effectiveness, tutoring must be implemented on a large scale; if it were so implemented, the concept has great potential for changing the total classroom atmosphere and for eliminating many of the conditions that made remediation necessary in the first place. There is a strong need for a research and development effort to develop a prototype model of a school in which tutoring is a central procedure, a school in which students at every grade level interact with other students as learners and tutors.

Such a school would be one where the traditional barriers between teacher and learner are broken down. It would represent a learning community in which learners, teachers, administrators, and parents share responsibility, pride, concern, and satisfaction in a cooperative effort to improve the learning of all.

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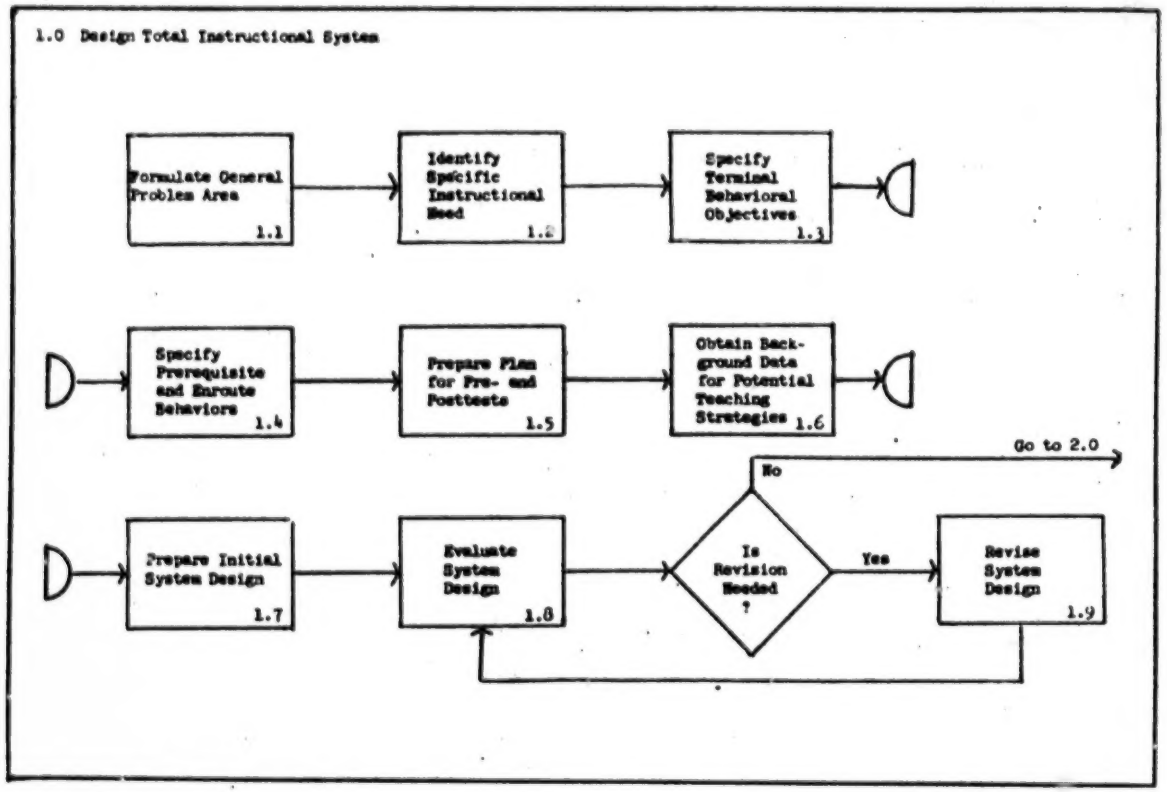
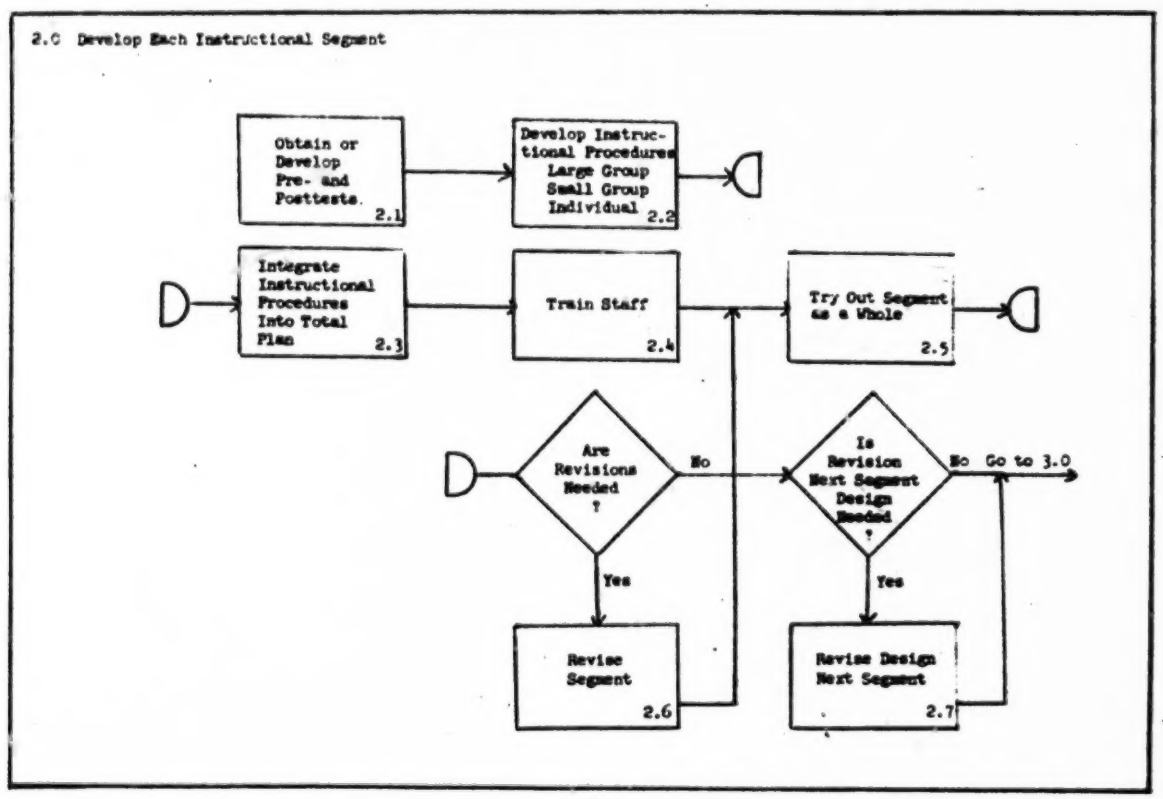
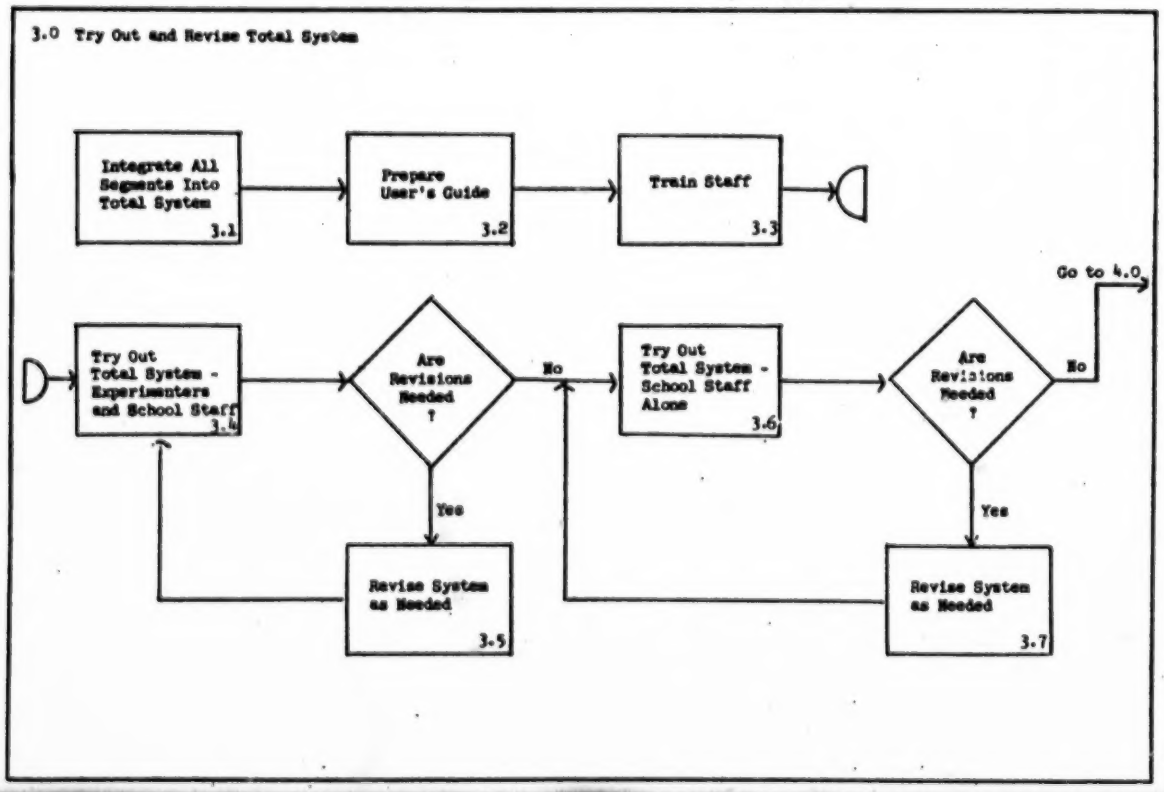
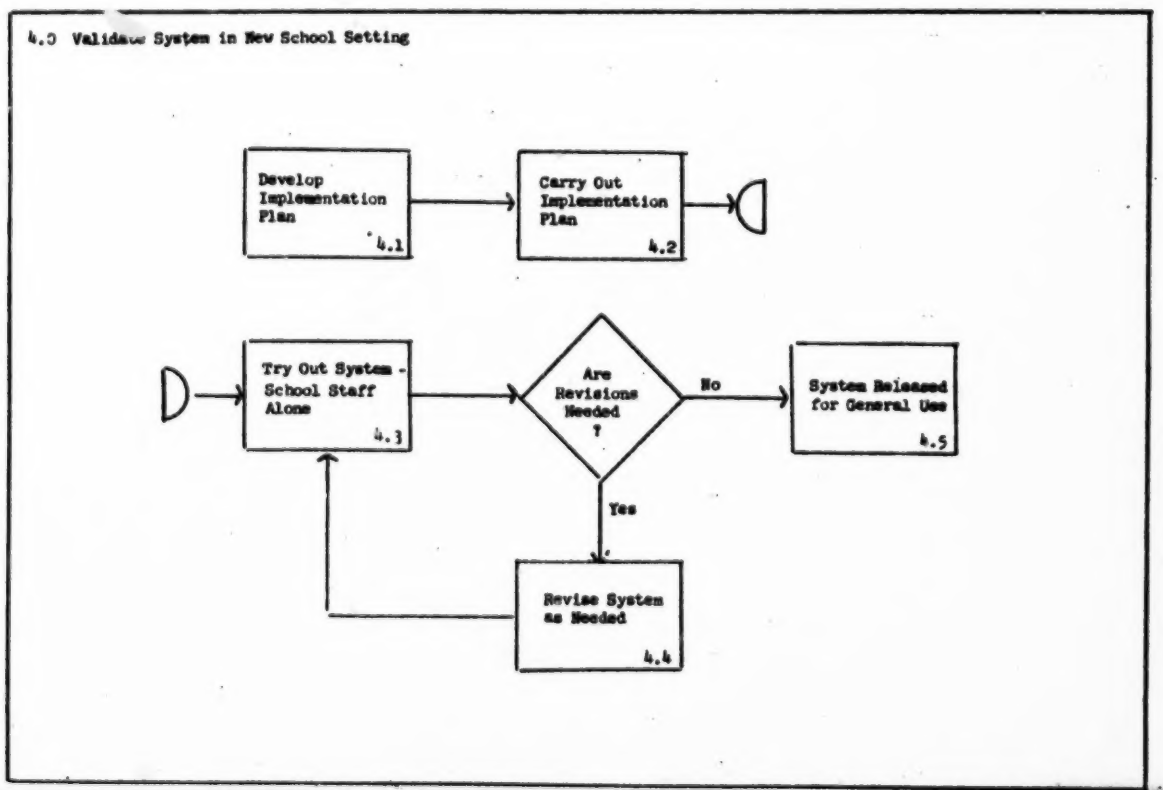
APPENDIX

DESCRIPTION OF EMPIRICAL EVALUATION-REVISION PROCEDURES FOR IMPROVING CLASSROOM INSTRUCTION


1.0 Design Total Instructional System
Formulate General Problem Area 1.1
Identify Specific Instructional Need 1.2
Specify Terminal Behavioral Objectives 1.3
Specify Prerequisite and Enroute Behaviors 1.4
Prepare Plan for Pre- and Posttests 1.5
Obtain Background Data for Potential Teaching Strategies 1.6
Prepare Initial System Design 1.7
Evaluate System Design 1.8
Is Revision Needed ?
No
Go to 2.0
Yes
Revise System Design 1.9


2.0 Develop Each Instructional Segment
Obtain or Develop Pre- and Posttests. 2.1
Develop Instructional Procedures Large Group Small Group Individual 2.2
Integrate Instructional Procedures Into Total Plan 2.3
Train Staff 2.4
Try Out Segment as a Whole 2.5
Are Revisions Needed ?
No
Yes
Revise Segment 2.6
Is Revision Next Segment Design Needed ?
No
Go to 3.0
Yes
Revise Design Next Segment 2.7


3.0 Try Out and Revise Total System
Integrate All Segments Into Total System 3.1
Prepare User's Guide 3.2
Train Staff 3.3
Try Out Total System - Experimenters and School Staff 3.4
Are Revisions Needed ?
No
Yes
Revise System as Needed 3.5
Try Out Total System - School Staff Alone 3.6
Are Revisions Needed ?
No
Go to 4.0
Yes
Revise System as Needed 3.7


4.0 Validate System in New School Setting
Develop Implementation Plan 4.1
Carry Out Implementation Plan 4.2
Try Out System - School Staff Alone 4.3
Are Revisions Needed ?
No
Yes
Revise System as Needed 4.4
System Released for General Use 4.5

1.0 DESIGN TOTAL INSTRUCTIONAL SYSTEM

1.1 Formulate General Problem Area

The developer starts with a general idea of the scope of the effort he is interested in undertaking. This may include the general curriculum area (e.g., reading, communication skills, arithmetic, etc.), the student population (socioeconomic status, grade level), and the approximate time-period involved (week, month, semester, year). The next step is to define more precisely the instructional need to be filled.

1.2 Identify Specific Instructional Need

1.2.1 Meet with school personnel. Meet with teachers and administrators within the target school district. Within the general area of concern, list and discuss problems or obstacles in achieving school's objectives. Determine tentative priorities.

1.2.2 Observe classroom instruction. Gather data related to previously identified problems.

1.2.3 Select tentative problem area.

1.2.4 Conduct informal trials with students. Interview and informally conduct instruction related to tentative problem area with a few students from target population.

1.2.5 Test students to verify problem.

1.2.6 Decide with school personnel on specific problem to be attacked.

1.3 Specify Terminal Behavioral Objectives

Meet with teachers and examine adequacy of existing statement of objectives. If necessary, revise or prepare new statement of objectives in behavioral terms. This statement specifies what the student will be able to do upon completion of instruction.

1.4 Specify Prerequisite and Enroute Behaviors

These are the behaviors required of the learner in order to achieve the terminal objectives. The prerequisite behaviors should be acquired prior to beginning the program. Enroute behaviors are those which will be developed by the instructional system.

Locate and examine adequacy of existing statements. If necessary, revise or prepare new statement of behaviors.

1.5 Prepare Plan for Pretest and Posttest Procedures

The plan should indicate the kind of instruments and procedures to be used and should include sample test items.

1.6 Obtain Background Data for Potential Teaching Strategies

1.6.1 Review relevant research.

1.6.2 Identify and describe the conditions under which the system will operate (resources and constraints).

1.6.3 Teachers instruct students using self-determined procedures and materials. Research and development staff observes instruction, tests students, analyzes results, and discusses results with teacher.

1.7 Prepare Initial Version of Instructional System Design

1.7.1 Specify organization and sequence of content, materials, methods, media, provisions for diagnosis and evaluation, strategies for large group, small group, individual instruction, and staff training requirements.

1.7.2 Flowchart sequence of instructional events. Show graphically the sequence of instructional events, the interrelationship of functions, and decision-making points.

1.8 Evaluate System Design

Teachers, administrators and consultants review system design and recommend changes. Evaluation, at this point, could still result in a decision that system is not needed or should receive lower priority than some other instructional need.

1.9 Revise System Design

If necessary, changes are made to the design and the initial version is ready to be used as the point of departure for the empirical development of the instructional system.

2.0 DEVELOP EACH INSTRUCTIONAL SEGMENT

Each instructional segment is developed, in turn, by repeating the same procedures described below (2.1-2.7). (When all segments have been developed in this way, they are ready to be integrated into a total system and tried out as such.)

2.1 Obtain or Develop Pre- and Posttests for Segment

Check sources to see whether pre- and posttests pertaining to the objectives are available. If so, obtain and check for adequacy. If satisfactory

pre- and posttests are not available, develop them. Design, try out, and revise items until test reliably discriminates between students who are known to have mastered the objectives and those who have not.

2.2 Develop Instructional Procedures

2.2.1 Large group instruction.

- Obtain materials. Check sources to see whether materials pertaining to objectives are available. Analyze materials and decide if they appear adequate for objectives.
- Develop needed materials. Prepare a first version of any materials needed, but not available, for large-group instruction. (If existing materials are available, use them as the first version.)
- Train staff. Provide needed training for teacher to administer instruction.
- Try out large-group instruction. Tryout includes a pretest to ascertain pupil entry level, administration of instruction, a posttest to measure student achievement after instruction, and observation of instruction by experimenters and analysis of results. Observational data and pre- and posttest data are examined to see how well the objectives have been achieved and whether further revisions are needed.
- Revise instructional procedure. Meet with teachers and discuss results. Make necessary revisions to procedures or materials.

. Continue trial and revisions of large group instruction. Continue trial and revision process until it is felt that significant improvement over first version has been achieved. Administer posttest. If results are not entirely satisfactory (i.e., if 90 percent of students do not master 90 percent of objectives), try a procedure other than large-group instruction. If results are satisfactory, proceed to development of next segment of instruction.

2.2.2 Develop small group instruction. All students who have not achieved specific objectives in large-group instruction are organized into a number of smaller groups, permitting greater opportunity for individual practice on the part of each student and opportunity for closer diagnosis of instructional problems. Initially, the same materials used in large-group instruction are used; materials and procedures are tried out and revised as in large-group instruction (essentially repeating procedures under 2.2.1) until they are successful with a number of students.

2.2.3 Develop individual instruction. All students who have not achieved specific objectives in either large- or small-group instruction are then instructed individually. Essentially, the same procedures as under 2.2.1 are followed. Various individual procedures are tried out and revised independently until they are found to work with some students.

2.3 Integrate Instructional Procedures into a Total Plan

All of the various procedures (large-group, small-group, and individual instruction) are integrated into a plan for the segment. The rules and the decision-making criteria governing use of each procedure are specified. (Sometimes it is strictly rule-following; at other times, teacher judgment is the critical factor.)

2.4 Train Staff

Provide training necessary for all personnel involved (e.g., teacher aides, tutors, parents) in administering the instructional segment.

2.5 Try Out Segment As a Whole

Tryout of the unit as a whole takes place in a classroom that has not been involved in the development of the segment. Tryout includes pretest, administration of instruction, posttest, observation of instruction by experimenters, and analysis of results.

2.6 Revise Segment

Revisions may be made to the segment as a whole or to individual procedures within a segment; revision may lead to more trials and revisions of particular procedures (e.g., small-group or individual instruction, materials, teacher practices, equipment, tutor training) and then to another tryout of the segment as a whole.

2.7 Revise Design of Next Segment

The tentative design for the next segment, formulated during the design phase, is reexamined in light of the results obtained and data gathered in developing the previous segment. The design of the next segment is revised if necessary.

3.0 TRY OUT AND REVISE TOTAL SYSTEM

The system as a whole is tried out with new classes, within the target school, first with participation of the experimenters and finally by school personnel alone.

3.1 Integrate All Segments into a Total System

Specifications developed for administering each segment of instruction are analyzed in light of the system operating as a whole. An integrated plan is worked out covering all instructional and support activities.

3.2 Prepare User's Guide

This guide describes the system in detail and provides specific directions for using it.

3.3 Train Staff

3.4 Tryout of Total System - Experimenters and School Staff

Tryout includes pre- and posttests, administration of instruction, observation by experimenters, and analysis of results.

3.5 Revise System as Needed

Revisions may affect the system as a whole, individual segments, or particular procedures within segments. Further, trials and revisions may be conducted at any or all of these levels, with the final trial always being of the system as a whole.

3.6 Tryout of Total System - School Staff Alone

The tryout is conducted in new classes without participation of the experimenters.

3.7 Revise System as Needed

4.0 VALIDATE SYSTEM IN NEW SCHOOL SETTING

The system is tried out in a new school where personnel have had no part in development of the instructional procedures and no contact with the experimenters. The administration of instruction is carried out entirely by school staff, without participation of the experimenters. The latter introduce the system to the school and withdraw until the tryout has been completed.

4.1 Develop Implementation Plan

4.2 Carry Out Implementation Plan

4.2.1 Meet with the district superintendent and reading specialists. Present background on educational problems and objectives with which the system deals. Describe the instructional system and how it was developed. (Emphasize teacher participation on research team.) Present data on effectiveness of system. Demonstrate aspects of the instructional system. Discuss requirements on part of school to make program work. Discuss implementation plan and modify according to suggestions of district. Obtain support for implementation plan.

4.2.2 Meet with principals and vice-principals of school district. Repeat procedures under 4.2.1 above; have principal present, from one of schools where system was developed, to answer questions. Choose volunteer school for tryout of system.

4.2.3 Meet with first-grade teachers of volunteer school. Repeat procedures under 4.2.1 above; have teacher present who worked with program in school where it was developed, to answer

questions. Ask for volunteers to try out program on an experimental basis. Choose volunteer classes.

4.2.4 Provide training for key personnel.

4.3 Tryout of System - School Staff Alone

All instructional and support functions are performed by school personnel without any assistance or participation by the experimenters. Results are analyzed jointly by school staff and experimenters. Decisions are formulated concerning revisions.

4.4 Revise System

Revisions are made, as necessary, to the instructional, support, implementation, or development procedures. If revisions are minor, system is released for general use. If not, it will be tried out again by the school staff.

4.5 System Released for General Use

When satisfactory results are achieved, the system is released for general use. Although the formal development has been completed, it is anticipated that each new school will apply the empirical evaluation-revision strategy in order to adapt the instructional system to its particular needs.

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10. AVAILABILITY/LIMITATION NOTICES

Distribution of this document is unlimited.

11. SUPPLEMENTARY NOTES	12. SPONSOR

13. ABSTRACT

The pilot study was conducted to determine the degree to which the evaluation-revision strategy could be applied to regular classroom instruction in which interactions among students, materials, and the teacher were considered.

There were two major outcomes expected from the study: first, an illustrative example of effective classroom instruction; and second, a model for obtaining such effective instruction. The second outcome was of greates concern, for an isolated example of effective instruction would be of minimal benefit if the means by which it was obtained were not clearly identified and reproducible.
This second outcome, a model of the developmental procedures, was intended to enable educators to answer this question: "Given specific educational objectives, how can an instructional system be developed that will enable almost all students to achieve the objectives?'

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14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Mexican-American students Instructional system Evaluation-revision procedures Tutoring						